

REMARKS

The applicants have studied the Office Action dated April 6, 1999, and have made amendments to the claims. It is respectfully submitted that the application, as amended, is in condition for allowance. By virtue of this amendment, claims 20-28 are pending. Claims 20 and 28 have been amended. The applicants respectfully request consideration and allowance of the claims in view of the above amendments and the following remarks.

Claims 20-23 and 25-27 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 5,646,063 to Mehta et al. ("the Mehta et al. '063 patent"). Claims 24 and 28 were rejected under 35 U.S.C. §103(a) as being obvious over the Mehta et al. '063 patent in view of U.S. Patent No. 5,130,268 to Liou et al. ("the Liou et al. '268 patent"). Claims 20-28 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 5,731,221 to Kwon ("the Kwon ' 221 patent"). These rejections are respectfully traversed.

Embodiments of the present invention are directed to an improved structure for isolating semiconductor devices formed on a semiconductor substrate. In particular, the formation of an isolation structure involving a dual depth, dual width trench reduces or eliminates some of the problems traditionally encountered at the intersection of a deep, single width trench and the surface of the substrate. This is accomplished by the formation of an initial trench (such as initial trench 18 as shown in Figures 1-5 of the present application) to a depth that is shallower than the depth of traditional deep, single width trenches.

For example, in one illustrative embodiment of the present application, as shown in Figures 1-5, the initial trench 18 may be approximately 2000-3000 Å wide and may extend beneath the surface 20 of the substrate 12 by approximately 500-1000 Å. The initial trench 18 in this illustrative embodiment may be formed as follows: (1) as shown in Figure 1, a masking

layer 10 may be formed above a substrate 12; (2) a layer of photoresist 14 may be formed above the masking layer 10; (3) the photoresist layer 14 may be patterned to define an opening 16; (4) thereafter, the portion of the masking layer 10 within the opening 16 may be removed; and (5) the initial trench 18 may be formed in the substrate 12. Further, since the second trench 26 in this illustrative embodiment may be formed (as shown in Figures 2-3) using spacers 24 formed in the initial trench 18, **without using photolithography**, the initial trench 18 may be formed to have the **smallest dimension** that may be formed using photolithography.

The Mehta et al. '063 patent, the Liou et al. '268 patent and the Kwon ' 221 patent cited by the Examiner do not disclose or suggest a method of forming such an improved structure, having a widest trench with a width that is at most approximately 3000 Å, for isolating semiconductor devices formed on a semiconductor substrate.

Claim 20, as amended, recites "said first recess having a first width **of at most about 3000 Å**" (emphasis added). Claim 28 has similar recitations. The Mehta et al. '063 patent, the Liou et al. '268 patent and the Kwon ' 221 patent do not disclose, teach or suggest that a first recess have a first width **of at most about 3000 Å**, as recited in the claims.

The Examiner rejected claims 20-28 over the Kwon ' 221 patent. In particular, the Examiner has identified the space W1 of the Kwon ' 221 patent, as being relevant to the claims. However, the space W1 is 0.5 microns (**5,000 Å**) in width (col. 4, line 14 of the Kwon ' 221 patent). Moreover, the **minimum** line width of the photoresist pattern formed is about 0.4-0.6 microns (**4,000-6,000 Å**), which may determine the **minimum** feature size possible for the space W1 (col. 3, lines 42-44 of the Kwon ' 221 patent). Consequently, the Kwon ' 221 patent does not disclose, teach or suggest that a first recess have a first width **of at most about 3000 Å**, as recited in the claims. Therefore, it is respectfully submitted that the rejection of

claims 20 and 28, and claims 21-27 that depend therefrom, under 35 U.S.C. §102(e) should be withdrawn.

Claim 20, as amended, also recites “forming a second recess in said substrate **within said first recess**” (emphasis added). Claim 28 has similar recitations. The Mehta et al. ’063 patent and the Liou et al. ’268 patent do not disclose, teach or suggest forming a second recess in said substrate **within the first recess**, as recited in the claims.

The Examiner rejected claims 20-28 over the Mehta et al. ’063 patent and the Liou et al. ’268 patent. In particular, the Examiner has identified the spacing 46 and the trench 45 of the Mehta et al. ’063 patent, and the recesses 22 and 22’ of the Liou et al. ’268 patent, as being relevant to the claims. However, the trench 45 is not formed **within** the spacing 46 in the Mehta et al. ’063 patent, and the narrow recess 22 is not formed **within** the wide recess 22’ in the Liou et al. ’268 patent. Consequently, the Mehta et al. ’063 patent and the Liou et al. ’268 patent do not disclose, teach or suggest forming a second recess in said substrate **within the first recess**, as recited in the claims.

Further, it is respectfully submitted that it would not have been obvious to modify the references cited by the Examiner. It is well-settled that a reference must provide some motivation or reason for one skilled in the art (working without the benefit of hindsight reconstruction using the applicant’s specification) to make the necessary changes in the disclosed device or method. The mere fact that a reference may be modified in the direction of the claimed invention does not make the modification obvious unless the reference expressly or impliedly teaches or suggests the desirability of the modification. *In re Gordon*, 221 USPQ 1125, 1127 (Fed. Cir. 1984); *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. App. 1985); *Ex parte Chicago Rawhide Mfg. Co.*, 223 USPQ 351, 353 (Bd. App. 1984). Indeed, the Federal Circuit stated:

... To draw on hindsight knowledge of the patented invention, when the prior art does not contain or suggest that knowledge, is to use the invention as a template for its own reconstruction--an illogical and inappropriate process by which to determine patentability. *W.L. Gore & Assoc. v. Garlock, Inc.*, 721 F.2d 1540, 1553, 220 USPQ 303, 312-13 (Fed. Cir. 1983). The invention must be viewed not after the blueprint has been drawn by the inventor, but as it would have been perceived in the state of the art that existed at the time the invention was made. *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1138, 227 USPQ 543, 547 (Fed. Cir. 1985).

Sensonics Inc. v. Aerosonic Corp., 38 USPQ2d 1551, 1554 (Fed. Cir. 1996).

The Mehta et al. '063 patent and the Liou et al. '268 patent fail to meet the basic requirement for a finding of obviousness established by the courts in *Sensonics*, *Gordon*, *Clapp*, and *Chicago Rawhide*. There is no suggestion in the references of modifying the devices or methods disclosed therein in the direction of the present invention, nor is there any suggestion of the desirability of such modifications (*i.e.*, forming a second recess in said substrate **within the first recess**). Thus, it is respectfully submitted that the ordinarily skilled artisan would have had no motivation to modify the reference as suggested by the Examiner. Therefore, it is respectfully submitted that the rejection of claims 20 and 28, and claims 21-27 that depend therefrom, under 35 U.S.C. §102(e) or, in the alternative, under 35 U.S.C. §103(a), should be withdrawn.

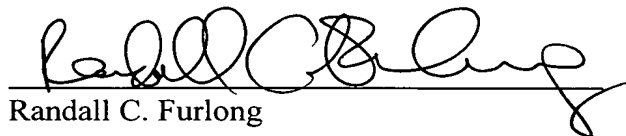
In view of the foregoing, it is respectfully submitted that the application and all of the claims are in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Houston, Texas telephone number (713) 934-4061 to discuss the steps necessary for placing the application in condition for allowance.

The Examiner is also invited to contact the undersigned attorney at (713) 934-4061 with any questions, comments or suggestions relating to the referenced patent application.

Respectfully submitted,

Date: May 31, 1999

A handwritten signature in black ink, appearing to read "Randall C. Furlong", is written over a horizontal line.

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